Space Weather Forecast

Issued on Friday, 27 October 2023 at 13:03 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Fast solar wind influence Days 3-4 (29-30 Oct) with G1-G2/Minor to Moderate Geomagnetic Storms likely.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Moderate with occasional Common-class flare activity and a peak Moderate flare at 26/2324 UTC from a filament lift-off close to the north eastern limb. There are currently six sunspot regions on the disc. There are two small regions in the south west disc, although one region shows some modest complexity having recently developed a number of intermediate spots. One region in the north east, continues to emerge from the eastern limb and is currently a small sunspot group contained within a relatively large area of plage, close to the origin of the recent Moderate flare. The other regions are small and simple.

No Earth-directed Coronal Mass Ejections (CMEs) have been observed in available imagery. The moderate-flare overnight produced a CME that has been analysed to clearly miss Earth. Additionally, recent partial disruptions of a couple of small filaments on the visible disc do not appear to have produced CMEs.

Solar Wind / Geomagnetic Activity: The solar wind showed a likely connection to a fast solar wind from a coronal hole. Solar wind speeds increased from around 390km/s to 480 km/s at the start of the period, fluctuating between slightly elevated and elevated levels 26/1700-2100 UTC with a peak around 540 km/s. The Interplanetary Magnetic Field (IMF), Bt, has been moderate, but decreased to weak around 27/1000 UTC. The north-south component, Bz, has been mostly orientated southward and has fluctuated between weak and moderate levels. However, it has largely been weak and fluctuating since around 26/2100 UTC.
Geomagnetic activity was Unsettled to Active (Kp 3-4) with a G1/Minor Geomagnetic Storm (Kp 5) interval 26/2100-2359 UTC. Activity has reduced in recent intervals to predominantly Quiet or Unsettled (Kp 2-3).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) remained at background levels with no solar radiation storms observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Low activity forecast with occasional Common-class flares. There is a slight, but increasing, chance of isolated Moderate flares. This increase is dependent on the development of sunspot regions on the disc, or the arrival or return of sunspot regions to the visible disc.

Solar Wind / Geomagnetic Activity: There are no Earth directed CMEs expected. Current fast solar wind enhancement is expected to wane during the next 24hrs with speeds returning to background levels. The next enhancement is then expected Day 3 (29 Oct) or early Day 4 (30 Oct) due to fast solar winds emanating from large coronal holes which are currently approaching centre disc. Speeds may increase to 550-700km/s. Quiet to Unsettled geomagnetic activity is expected Days 1-2 (27-28 Oct) with a diminishing chance of an Active (Kp 4) interval. G1-G2/Minor to Moderate Geomagnetic Storms (Kp 5-6) are increasingly likely Days 3-4 with the onset of fast solar winds.

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The auroral oval is expected to see enhancement Days 3-4 (29-30 Oct) following enhancement from fast solar winds. As such, the aurora may be visible across parts of Scotland and Northern Ireland under clear skies.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is forecast to persist at background with no solar radiation storms occurring.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	10	10	40	60
Strong	G3	No	1	1	5	10
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	10	10	15	20
Very Active	R3 to R5 X	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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